

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 5

ONALASKA MUNICIPAL LANDFILL SITE
La Crosse County, Wisconsin

FIVE-YEAR REVIEW (Type Ia)

I. Introduction

Purpose

The United States Environmental Protection Agency (U. S. EPA) has conducted a Type Ia five-year review for the Onalaska Municipal Landfill (Onalaska) Superfund site pursuant to CERCLA section 121(c), NCP section 300.400(t)(4)(ii), and OSWER Directives 9355.7-02 (May 23, 1991), 9355.7-02A (July 26, 1994), and 9355.7-03A (December 21, 1995). The purpose of a five-year review is to ensure that a site remedy remains protective of human health and the environment and that the remedy is functioning as designed. A Type Ia five-year review is applicable to the Onalaska site since certain response actions (see below) are ongoing. This document will become part of the Onalaska site file.

Site Characteristics

The Onalaska site is located in the Township of Onalaska, about 10 miles north of La Crosse, Wisconsin. The 11-acre site includes the 7-acre former Township landfill and is situated 400 feet east of the Black River, near the confluence of the Mississippi and Black Rivers. The Black River is located within the Upper Mississippi River Wildlife and Fish Refuge, a wetlands area which supports numerous migrating species of birds and is also used for hiking, fishing, hunting, and other recreational purposes by area residents and visitors.

The area surrounding the site is generally rural, although several residences are located within 500 feet to the north and to the south of the landfill. A subdivision of about 50 homes is located about 1.25 miles southeast of the site. Agricultural lands are located south of the landfill, and intermittent woods and grasslands border the site to the east.

The Onalaska site was mined as a sand and gravel quarry in the early 1960's. Quarry operations ceased in the mid-1960's and the Town began to use the site as a municipal landfill, although for a time both municipal and chemical wastes were disposed of in the landfill. In 1978, the Wisconsin Department of Natural Resources (WDNR) determined that the landfill operation did not meet state solid waste codes and ordered the Town to close the landfill by September 1980. After disposal operations ceased, the Town capped the landfill in June 1982.

In September 1982, the WDNR sampled four landfill monitor wells and several nearby residential wells for compliance with drinking-water standards. The investigation documented that the sand and gravel aquifer beneath the landfill serves as the primary source of drinking water for area residents and that groundwater contamination had occurred within and around the site. One residential well, located southwest of the landfill, was found to exceed the Federal drinking-water standard for barium (1.0 mg/L). The well sample also contained five organic compounds at concentrations above background levels. A landfill monitor-well sample was found to be contaminated with toluene at a concentration of 14.7 mg/L, which is well above the State groundwater-quality Enforcement Standard (0.343 mg/L) and the federal drinking-water (2.0 mg/L) standard. The Town replaced the contaminated residential well with a deep, uncontaminated well in January 1983.

Pursuant to CERCLA, U. S. EPA inspected the Onalaska site in 1983. Subsequent to the submittal of the Site Inspection report in May 1983, the U. S. EPA placed the site on the National Priorities List (NPL) in September 1984.

Remedial Investigation

U. S. EPA, in consultation with the WDNR, conducted a Remedial Investigation and Feasibility Study (RI/FS) at Onalaska from April 1988 through December 1989. The major findings of the RI included:

- The landfill is the source of groundwater contamination. A groundwater contaminant plume consisting of organic and inorganic compounds had migrated at least 800 feet from the southwestern edge of the landfill. The leading edge of the contaminant plume appeared to be discharging into nearby wetlands and the adjacent Black River.
- The upper groundwater aquifer consists primarily of sand and is approximately 135 feet thick. Local residences utilize this aquifer as a primary source of drinking water.
- The predominant organic compounds of concern included toluene, xylene, 1,1-dichloroethane (1,1-DCA), and trichloroethene (TCE), based upon concentrations and potential impacts to human health and the environment.
- Site soils located above the water table and adjacent to the southwestern edge of the landfill were contaminated with naphtha solvents derived from the landfill. The contaminated soil zone occurred from 11 feet to 15 feet below ground surface and up to 150 feet from the landfill. Soil samples indicated that contaminant levels of up to 550 mg/kg were present and were a continual source of groundwater contamination.
- The original landfill cap had deteriorated and did not meet the landfill closure regulations in effect at the time the landfill closed. The cap was originally to be composed of 2 feet of compacted clay, but the RI showed that the cap is composed of sandy soils in certain portions and that it is only 1-foot thick in other portions.
- Magnetometer anomalies, as well as site records, suggested that up to 1000 55-gallon drums were likely to have been disposed of in the landfill. Although several crushed and empty drums were found in the landfill during excavation of test pits, the RI could not ascertain whether the drums are concentrated in anyone area, although it may be likely that many of the drums would be in the same condition as the drums that were found in the test pits.
- The average depth to the water table and the depth of waste disposal is 15 feet. As a result, it is likely that refuse is periodically in direct contact with groundwater. Soil below the water table does not appear to be greatly affected by landfill contaminants, in that the hazardous substances found in the groundwater are soluble. Soluble contaminants would tend to remain dissolved in the groundwater rather than sorbing onto sand particles.
- Potential long-term exposure to low levels of VOCs through the use of private wells in contaminated groundwater and plausible adverse discharges of contaminants to the wetlands and Black River downgradient of the landfill were identified as the principal threats to human health and the environment.

Record of Decision

Based on the findings of the RI, U. S. EPA completed a feasibility study (FS) that evaluated remedial alternatives to address migration of the groundwater contaminant plume. U. S. EPA completed the FS in December 1989. U. S. EPA then issued a Record of Decision (ROD) in August 1990 that called for the following actions to mitigate the areas of concern:

- Installation of a landfill cap in accordance with federal and state requirements;
- Installation of a groundwater extraction and treatment system to capture and treat contaminants in the groundwater immediately downgradient of the landfill;

- Installation of an air injection system within the area of soils contamination to enhance the bioremediation of organic contaminants; and
- Implementation of a groundwater, surface water, and sediment monitoring program to ensure the adequacy of the cleanup.

The selected remedy establishes a containment and treatment system to eliminate the principal threat posed to human health and the environment by isolating the source of groundwater contaminants in the landfill and eliminating those in the adjacent soils, preventing the further migration of VOCs in groundwater, and by treating extracted groundwater to acceptable discharge limits.

The selected remedy established cleanup standards for groundwater based on Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and Wisconsin Administrative Rule Chapter NR 140 Enforcement Standards (ES) and Preventive Action Limits (PAL) for groundwater protection. The selected remedy established an estimated cleanup goal of 80 to 95 percent biodegradation of the organic compounds in the soils adjacent to the landfill.

U. S. EPA entered into a Superfund State Contract with WDNR in 1991 which provided that the state would fund 50% of the remedial action. U. S. EPA then began to implement the Remedial Design (RD) and Remedial Action (RA).

II. Discussion of Remedial Objectives

U. S. EPA completed the landfill cap RD in July 1992 and the groundwater extraction and treatment and the bioremediation systems RD in September 1992.

A Wisconsin Pollution Discharge Elimination System (WPDES) "permit" was issued by the WDNR for the discharge of treated groundwater to the Black River. WDNR determined that air stripping and iron precipitation were acceptable Best Available Technology (BAT) for treatment.

A 3-month treatability study was conducted in the laboratory to determine the ability of the organic contaminants to degrade and to attempt to determine plausible cleanup goals, optimal air injection conditions, and losses of VOCs due to air stripping or volatilization. Testing showed that approximately 15 % of the hydrocarbons were biodegraded during the 3-month test and that approximately 5-6 years of air injection would be needed to reach the target cleanup goal. As a result, U. S. EPA recommended that a full-scale biotreatment system be installed, for the cost of performing a pilot study in the field would approach that of a full-scale treatment system.

The landfill cap construction subcontract was awarded on March 25, 1993, and construction commenced on May 1, 1993. A multi-layer clay cap was installed over the landfill. The cap was completed in November 1993.

The groundwater and soils construction subcontract was awarded on June 11, 1993, and construction began on July 12, 1993. Five groundwater extraction wells were installed downgradient of the landfill and are designed to pump a total of 800 to 1000 gallons per minute. A treatment plant was constructed nearby, where the extracted groundwater is subjected to aeration and pH adjustment (iron precipitation), clarification (iron removal), air stripping (VOC removal), and pH readjustment prior to discharge to the Black River. Temporary activated carbon units were placed in the treatment train prior to discharge as a back-up measure while the treatment plant components underwent a 3-month "shakedown" period. The groundwater extraction and treatment system was completed in June 1994.

Approximately 29 shallow air-injection wells were installed to bioremediate the organic compounds in the contaminated soils adjacent to the landfill. During start-up, the contractor turned the air injection system on to achieve steady-state conditions, and then off to measure oxygen uptake (respiration) rates in the wells. Results showed that biodegradation was occurring as oxygen levels began to fall rapidly. The air permeability of the soil was measured and found to be as predicted, based on the laboratory study. Lastly, the system was balanced so that each well was injecting the proper amount of air into the soil. Installation of the biotreatment system was completed in June 1994.

A pre-final inspection was conducted by the project managers for U. S. EPA and WDNR on June 1, 1994. At that time, it was determined that the landfill cap, groundwater, and bioremediation systems were constructed as designed and that they were operational. A punch list of minor tasks to be completed was developed and a schedule for completion of those items was given to both the landfill cap and the groundwater subcontractors by U. S. EPA's contractor.

Region 5 signed the Onalaska preliminary close-out report (PCOR) on July 29, 1994, and within that document scheduled the completion of this five-year review by May 1998.

Quality Assurance/Quality Control

Remedial design and remedial action construction management activities at the site were conducted by U. S. EPA's design contractor through the ARCS contracting program. The components of the remedial action were constructed by subcontractors and sub-subcontractors to U. S. EPA's contractor. All design plans and field activities were reviewed and approved by U. S. EPA, in consultation with WDNR, to ensure consistency with the ROD, the RD and RA work plans, and federal and state requirements.

The design and construction QA/QC program utilized throughout the RD/RA was in accordance with U. S. EPA protocols. Details of the analytical procedures used to ensure the quality of the work are contained in the approved Quality Assurance Project Plan (QAPP) for the pre-design studies and for construction of the landfill cap and the groundwater extraction and treatment and bioremediation systems (Construction Quality Assurance Plan (CQAP)). The construction QA/QC program utilized has been sufficient to allow U. S. EPA to make the determination that all reported materials specifications are adequate and construction methods used allowed remedy construction to be satisfactorily performed in accordance with the ROD.

The remaining groundwater, surface water, and sediment monitoring activities during the conduct of the Long Term Response Action (LTRA) and Operation and Maintenance (O&M) phases have been performed in accordance with an approved QAPP. The laboratories used for the analysis of groundwater quality will either have been approved by U. S. EPA or will be audited by U. S. EPA to ensure that proper analytical protocols shall be employed.

Monitoring Program

A monitoring program was established for the LTRA and O&M phases of the cleanup. Groundwater, surface water and sediments, and soils are monitored on a periodic basis.

Initially, quarterly groundwater monitoring was performed to ensure that hydraulic capture of the plume was occurring and that chemical levels in the groundwater were decreasing. Analytes include the chemicals of concern listed in the ROD and those parameters required under the WPDES discharge "permit" issued by WDNR. As of this date the monitoring is performed on a semi-annual basis. U. S. EPA, in consultation with WDNR, will certify completion of groundwater remediation activities once it has been determined that clean-up levels have been attained and maintained for all chemicals of concern listed in the ROD.

Surface water and sediments are monitored by WDNR on an annual basis to ensure that neither the groundwater contaminant plume or the treated water that is discharged to the Black River have an adverse impact on aquatic environments.

Soil gas was sampled periodically to ensure that bioremediation of the organic compounds in the sandy soils was occurring. Based on current data, U. S. EPA, in consultation with WDNR, now certifies that soil remediation activity is complete since it has been demonstrated that the bioremediation system no longer contributes to the cleanup of the contaminated soils.

The landfill cap is inspected periodically by the Town of Onalaska, under the auspices of a Consent Decree reached with U. S. EPA. The Town will also perform required maintenance.

Results

As stated above, groundwater extraction, treatment, and monitoring will be required until it has been demonstrated that groundwater clean-up levels have been attained. The ROD estimated that the groundwater extraction and treatment system would need to operate for between 5 and 30 years to achieve required cleanup levels. However, after 5 years of operation, and thereafter in increments of 5 years, groundwater quality will be evaluated to determine if the remedial action objectives have been met. If, after the groundwater extraction and treatment system has been operating for a minimum of 5 years, it becomes apparent that it is not technically or economically feasible to achieve clean-up levels, then a (Wisconsin) alternative concentration limit (WACL) may be established for the target compounds. Except where the background concentration of a compound exceeds an ES, the WACL established may not exceed the ES for that compound. Once the standards are met, whether they are ROD standards or WACLs, the groundwater cleanup program will have been completed.

The most recent semi-annual groundwater monitoring event occurred in March 1998. Analytical and water level results demonstrate that the pumping wells are capturing the contaminant plume and that VOC levels have fallen significantly. Certain metals continue to exceed PALs and certain wells exceed PALs for one or two VOCs. Interior wells within the landfill show higher levels of contaminants and it is surmised that these levels would eventually impact water quality outside of the landfill should the treatment system be shut down. Lastly, water level data demonstrate that the wetlands are not being adversely impacted by the drawdown caused by the pumping wells, although the extent of drawdown caused solely by the pumping wells could not be accurately estimated unless the wells were turned off.

The ROD contained U. S. EPA's estimate that bioremediation would destroy a minimum of 80% and a maximum of 95% of the organic compounds in the soils. U. S. EPA operated the bioremediation system until last year when it was shown that no further biodegradation was occurring. The demonstration consisted of taking oxygen level readings in the subsurface and comparing them to historical levels. Prior to implementing the bioremediation remedy, soil gas oxygen levels were found to be less than 20% and carbon dioxide levels were greater than 1%, demonstrating that bioremediation was occurring. Soil gas oxygen levels are now at 20-21% and carbon dioxide levels are very low, demonstrating that no bioremediation is taking place. Soil gas oxygen levels will be monitored again next year to confirm the current results. Upon confirmation, U. S. EPA will consider the bioremediation cleanup phase to be at an end.

U. S. EPA does not plan to sample the affected soil layer to determine whether the ROD estimate of 80-95% destruction has occurred since there was a very large range of initial concentrations of VOCs in the soil over a very small sampling area. Further remediation of residual VOCs in soil, if any, will not be required to protect human health and the environment, for the groundwater treatment system is located downgradient of the contaminated soil area and it will capture any residual VOCs migrating from the source area towards the extraction wells.

III. Recommendations

The construction of the landfill cap, groundwater extraction and treatment facility, and the bioremediation treatment system was completed in June 1994 and operation and maintenance is ongoing. U. S. EPA recommends that the groundwater treatment facility continue to be operated as designed until final groundwater cleanup levels, as set forth in the ROD, are achieved. Further, the Town of Onalaska should continue to monitor the landfill cap and landfill gas levels in accordance with state requirements and recommendations.

IV. Statement on Protectiveness

With the continued implementation of the remedial action (groundwater extraction and treatment) pursuant to the ROD and as designed, the remedy selected for the Onalaska site remains protective of human health and the environment.

V. Next Five-year Review

The next five-year review at the Onalaska site is scheduled to be conducted on or about July 13, 2003. (Note: Future five-year reviews will be performed by the State, for it is obligated to take over full operation and maintenance of the groundwater extraction and treatment facility on July 20, 2004.)